Abstrak

Jumlah penumpang kereta api Jabodetabek (commuter line) pernah mencapai 1 juta orang per hari. Commuter line melayani 6 rute dengan 80 stasiun, padatnya jadwal kereta perlu diimbangi dengan performa kereta api salah satunya saat pengereman. Pengereman melibatkan benda berbahan logam; blok rem, roda dan lintasan (rel). Gesekan antara roda kereta dan rel saat pengereman menimbulkan energi panas. Energi yang timbul dari pengereman kereta berpeluang untuk diteliti lebih lanjut. Penulis menganalisa timbulnya energi panas sebagai energi yang terbuang saat pengereman. Proses analisa menggunakan model pengereman kereta api. Penggerak kereta api dimodelkan dengan motor Direct Current (DC), pejal baja sebagai blok rem, roda dan lintasan (rel). Sensor kecepatan terkopel dengan motor DC, hasil deteksi sensor sebagai nilai kecepatan kereta (km/jam). Pulsa luaran sensor kecepatan diinput ke kontroler Arduino Mega, bersamaan dengan massa pejal didapatkan nilai gaya gesek (Fk) pengereman. Perubahan suhu permukaan pejal mempengaruhi besar energi yang timbul saat gesekan. Suhu pejal awal (T_0) dipengaruhi suhu ruangan dan suhu pejal setelah gesekan (T_1), perubahan suhu dikonversi ke bentuk energi. Analisa hubungan Fk dengan energi, pengujian data pada tiga jenis pejal berbeda massa. Data kecepatan dan suhu tiap pejal dibandingkan satu sama lain. Jika gaya gesek bernilai 1,864 Newton maka nilai Energi yang dihasilkan yaitu 37,31 Joule.

Kata kunci: Arduino, Energi, Fk, Pengereman, Sensor

Abstract

The number of the Jabodetabek railway (commuter line) passengers in Mei 2017 up to 1 million people. Commuter line serves 6 routes with 80 stations. The density of train schedule needs to be balanced with good performance of the train, such as braking system. The braking system involves metal objects; brake blocks, wheel and railway track. The friction between wheels of train and railway track during braking generates thermal energy. Thermal energy due to braking as research opportunity of the energy which lost. This study using train braking models. The train braking system modeled by Direct Current (DC) motor as drive, solid steel as a brake block, wheel and railway track. The speed sensor coupled with DC motor and temperature changes at solid surface detected by temperature sensor (PIR). Output speed sensor pulses are inputted to the Arduino Mega controller, as the train speed value (km/h). The mass of steel influence the friction force (Fk) that appear during braking. The PIR sensor using infrared light to obtain temperature changes of solid steel. First temperature (T0) of solid steel is affected by room temperature. The temperature of solid steel later (T1), ΔT (T1 − T0) converted to energy. Railway braking model using three different types mass of solid steel. Analysis relationship between Fk and energy, compares all of data from three types solid steel. If the friction force is worth 1.864 Newton then the value of energy produced is 37.31 Joule.

Keywords: Arduino, Energy, Fk, Braking, Sensor